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JOB STATUS MONITORING METHOD, SYSTEM AND PROGRAM

BACKGROUND OF THE INVENTION

The present invention relates to a job status monitoring system for monitoring operation or statuses of jobs executed on a computer, and in particular, to a

5 technique effectively applied to a job status monitoring system for monitoring statuses of jobs by efficiently displaying monitoring items and information items of failure on a job status monitoring screen.

In a conventional job status monitoring

10 system running on a computer, information items indicating statuses of scheduled jobs to be executed later and a status of a current job currently in execution are collected and are displayed on a monitoring screen in a first display method. When the

15 current job in execution abnormally terminates due to, for example, occurrence of an error, the current job in execution and scheduled jobs which possibly are affected by the current job are displayed in a second display method other than the first display method to

20 thereby explicitly notify the occurrence of abnormality to the operator monitoring the job statuses.

For example, there has been well known a network monitoring method in which, for example, at change of a monitoring status of an object or item

25 being displayed using a first mark, a preceding status

is displayed using a second mark other than the first

mark and a current status is displayed using the first

mark.   This operation is repeatedly conducted at a

predetermined interval of time in a dynamic way so that

5   the operator visually recognizes the status change.

Reference is to be made to JP-A-9-62542.

In the prior art, statuses of jobs normally

executed and those of jobs executed only once per year

or month are also displayed on the monitor screen.

10   Therefore, to monitor a complex job a large number of

jobs, the statuses of the jobs displayed on the monitor

screen lead to a problem of difficulty, that is, the

monitoring operation of a large number of jobs cannot

be efficiently conducted.

15   SUMMARY OF THE INVENTION

It is therefore an object of the present

invention, which has been devised to solve the problem,

to provide a technique capable of efficiently

monitoring statuses of jobs executed on a computer and

20   efficiently coping with failure in the jobs at a high

speed.

According to the present invention, there is

provided a job status monitoring system to monitor

statuses of jobs executed on a computer in which jobs

25   scheduled to be executed in a zone of time to browse

job statuses are selected and the statuses of these

jobs are displayed.

In the job status monitoring system according to the present invention, when schedule information including an execution start schedule date and time item to start execution of a job is changed (also addition or deletion of schedule information) or execution result value information including a execution result time indicating a period of time used to execute a job is changed (also addition or deletion of execution result value information), a job executing section generates an event indicating the change and notifies the event to a integrated monitoring section.

The integrated monitoring section receives the event and obtains the schedule information indicating a job execution schedule and then sets an execution monitoring start date and time item to start monitoring the job and an execution monitoring end date and time item to finish monitoring the job using the execution start schedule date and time of the job and the execution result time of the job.

In the operation, it is also possible to set a predetermined period of time according to information which possibly influences execution of the job, for example, an rate of operation of the computer executing the job or the number of abnormal terminations. The period of time is additionally set immediately before and after a time zone from the execution start schedule date and time of the job to a point of time determined by adding a period of job execution time to the

execution start schedule date and time. This resultantly sets the execution monitoring start schedule date and time and the execution monitoring end schedule date and time.

5   It is also possible to obtain a mean value from the execution result time values obtained as results of execution of the job. The mean value is then set as an execution time optimal value. Or, it is also possible to calculate, according to a relationship 10   between the execution result time and the rate of operation at execution of the job, an execution time optimal value required to execute the job at the rate of operation. Finally, the execution monitoring start schedule date and time and the execution monitoring end 15   schedule date and time are set using the execution time optimal value.

        Next, the integrated monitor screen browsing section receives a browsing start date and time item indicating the date and time to start browsing the 20   statuses monitored as above and a browsing end date and time item indicating the date and time to end browsing the statuses. The browsing section then sends to the integrated monitoring section the browsing start date and time item and the browsing end date and time item 25   as well as information of a browsing place to browse the statuses, i.e., information indicating a place at which the integrated monitor screen browsing section is installed.

The integrated monitoring section receives the information sent from the integrated monitor screen browsing section and compares a browsing time zone indicated by the browsing start date and time and the

5   browsing end date and time with a monitoring time zone indicated by the execution monitoring start date and time and the execution monitoring end date and time. If these time zones overlap with each other, the integrated monitoring section selects as a browsing

10   object or item a job to which the execution monitoring start date and time and the execution monitoring end date and time are set.

In this operation, the integrated monitoring section compares the browsing place to browse the

15   monitored statuses with an execution place where the job is executed to determine whether or not any difference exists in time therebetween. If such a time difference is present, the integrated monitoring section corrects the information of the date and time

20   and then selects a browsing object.

Thereafter, the integrated monitoring section generates monitor screen data to display a monitored status of the job selected as the browsing object and sends the data to the integrated monitor screen

25   browsing section. When the data is received, the integrated monitor screen browsing section displays a monitor screen on a display using the monitor screen data.

As above, in the job status monitoring system according to the present invention, the manager to monitor statuses of jobs of applications for business sets a relatively short period of time such as one hour

5 or one day as the browsing date and time. The system then extracts application jobs scheduled for execution during the browsing time zone thus set by the manager and generates monitor screen data to display only information regarding the extracted jobs and other

10 items such as failure associated with the jobs. This restricts the number of jobs to be monitored by the manager. Therefore, the system can efficiently cope with failure at a high speed.

According to the job status monitoring

15 system of the present invention described above, the system selects the jobs scheduled to be executed during the time zone to browse the monitored statuses and displays the monitored statuses of the jobs. Therefore, the system can efficiently monitor at a high

20 speed the statuses of the jobs executed on a computer and can similarly cope with failure in the jobs at a high speed.

Other objects, features and advantages of the invention will become apparent from the following

25 description of the embodiments of the invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram showing an overall configuration of an embodiment of a job status monitoring system.

FIG. 2 is a diagram showing an example of data items in a schedule table of the embodiment.

FIG. 3 is a diagram showing an example of data items in an execution result value table of the embodiment.

FIG. 4 is a diagram showing an example of data items in a monitoring item table of the embodiment.

FIG. 5 is a diagram showing an example of data items in a browse screen display time adjusting table of the embodiment.

FIG. 6 is a flowchart showing a processing procedure to correct a browsing date and time item in the embodiment.

FIG. 7 is a flowchart showing a processing procedure of browsing object selection in the embodiment.

FIG. 8 is a diagram showing an example of data items in a data saving table of the embodiment.

FIG. 9 is a diagram showing an example of a graph obtained by analyzing execution result values in the embodiment.

FIG. 10 is a flowchart showing a procedure of processing to calculate an execution time optimal value in the embodiment.

FIG. 11 is a diagram showing a display example in tree structure on a job monitor screen in the embodiment by the current technique.

FIG. 12 is a diagram showing a display example in tree structure on a job monitoring screen in the embodiment by this invention.

FIG. 13 is a diagram showing an example of a display image in a map layout on a job monitoring screen of the embodiment by the current technique.

FIG. 14 is a diagram showing an example of a display image in a map layout on a job monitoring screen of the embodiment by this invention.

DESCRIPTION OF THE EMBODIMENTS

Description will now be given of an embodiment of a job status monitoring system to monitor statuses of jobs executed on a computer.

FIG. 1 shows an overall configuration of an embodiment of a job status monitoring system. As can be seen from FIG. 1, the embodiment includes a integrated monitoring section 2, a integrated monitor screen browsing section 3, a point monitoring section 4, a job executing section 5, a schedule storage part 6, an execution result value storage part 7, an event issuing part 8, a monitoring item storage part 9, a data saving section 10, a monitoring item acquiring part 11, an execution result value calculating part 12, a browse screen display time adjusting part 13, a

browsing date and time correction part 14, an event receiving part 15, a integrated monitor screen data generating part 16, a browsing date and time setting part 17, and a monitor screen display part 18.

5   The integrated monitoring section 2 is a processing section to monitor statuses of jobs by combining information via a network 1 from at least one job executing section 5 with information from the point monitoring section 4. The integrated monitor screen

10 browsing section 3 is a processing section to display a integrated monitor screen to monitor job statuses using integrated monitor screen data created by the integrated monitoring section 2.

        The point monitoring section 4 is a

15 processing section to monitor statuses of associated devices such as a central processing unit (CPU), a memory, a magnetic disk device, and a network which influence execution statuses of jobs. Using information of the job statuses, the section 4 obtains

20 information regarding an rate of operation of the computer.

        The job executing section 5 is a processing section to execute jobs according to a schedule such as a job to calculate a total amount of actual job hours

25 and a total amount of travelling expenses, a salary calculation job, a backup job, and a software distribution job. The section 5 also monitors statuses of these jobs.

The schedule storage part 6 is a processing part to store an execution schedule of jobs for execution by the job executing section 5 in a schedule table 20 to control the job execution schedule. The

5 execution result value storage part 7 is a processing part to store and control, in an execution result value table 30, items regarding jobs executed by the job executing section 5 such as a execution result time indicating a period of time used to execute a job, a

10 termination state, an execution start date and time item, and an execution end date and time item.

The event issuance part 8 is a processing part to operate when any item is changed in the schedule table 20, the execution result value table 30,

15 and a monitoring item table 40. The part 8 notifies the change as an event to the integrated monitoring section 2.

The monitoring item storage part 9 is a processing part to store states of the resources

20 influencing the job execution statuses in the monitoring item table 40 to control the states of the resources.

The monitoring item acquiring part 11 acquires monitoring items such as schedule information

25 indicating a job execution schedule, execution result values such as a execution result time used for job execution, and an rate of operation of a computer having executed a job from the job executing section 5

and the point monitoring section 4. The part 11 establishes a correspondence between the monitoring items according to indices such as a computer name beforehand assigned to the computer.

5　　　　　The execution result value calculating part 12 is a processing part to calculate, according to information such as the execution result time and the rate of operation obtained by the monitoring item acquiring part 11, a period of execution time to be

10　used in the setting of the execution monitoring start date and time and the execution monitoring end date and time.

　　　　　The browse screen display time adjusting part 13 is a processing section operated when a browsing

15　time zone represented by the browse start date and time to start browsing the monitored statuses and the browse end date and time to finish browsing the monitored statuses overlaps with a monitoring time zone represented by the execution monitoring start date and

20　time and the execution monitoring end date and time described as above. In this situation, the part 13 selects as a browsing object a job to which the execution monitoring start date and time and the execution monitoring end date and time are set.

25　　　　　The browsing date and time correction part 14 is a processing part to correct the information of the date and time items according to the difference in time between the browsing place to browse the monitored

statuses and the execution place to execute jobs. The event receiving part 15 is a processing part to receive an event notified from the event issuance part 8. The part 15 notifies the change indicated by the event to

5 another processing section or part and stores the change in the data saving section 10.

The integrated monitor screen data generating part 16 is a processing part to create monitor screen data to display the monitored statuses of the job

10 selected as a browsing object by the browse screen display time adjusting part 13.

The browsing date and .time setting part 17 is a processing part to receive specification items of the browsing start date and time and the browsing end date

15 and time to send the browsing start date and time, the browsing end date and time, and information of the browsing place to browse monitored statuses to the integrated monitoring section 2.

The monitor screen display part 18 is a

20 processing part to receive the monitor screen data created by the integrated monitor screen data generating part 16 to display a monitor screen to browse statuses of jobs.

It is assumed that programs to make the job

25 status monitoring system serve as the integrated monitoring section 2, the integrated monitor screen browsing section 3, the point monitoring section 4, the job executing section 5, the schedule storage part 6,

the execution result value storage part 7, the event
issuing part 8, the monitoring item storage part 9, the
monitoring item acquiring part 11, the execution result
value calculating part 12, the browse screen display

5   time adjusting part 13, the browsing date and time
correction part 14, the event receiving part 15, the
integrated monitor screen data generating part 16, the
browsing date and time setting part 17, and the monitor
screen display part 18 are recorded on a recording

10 medium such as a compact disk (CD) read-only memory
(ROM). The programs in the recording medium are then
stored in a storage such as a magnetic disk and are
finally loaded therefrom in a memory for execution
thereof. It is also possible to use recording media

15 other than the CD-ROM. The programs may also be
installed in an information processing apparatus from
the recording medium. Or, the user may access the
recording medium via a network to use the programs.

FIG. 2 shows an example of data items in a

20 schedule table of the embodiment. As shown in FIG. 2,
the schedule table 20 under control of the schedule
storage part 6 includes a job name 21 to store a name
of a job to be executed, a date and time type 22 to
store a schedule type to discriminate the application

25 types such as a weekly application to be executed once
a week, a daily application to be daily executed, and
an application to be executed on a particular day
specified in advance, an execution start schedule date

and time item 23 to store a date and time item to start execution of the job, an execution place 24 to store a country and an area of the same international date for the execution of the job, and a related item 25 to

5   establish a correspondence between the job and a monitoring object of the point monitoring section 4.

FIG. 3 shows an example of data items in an execution result value table of the embodiment. As can be seen from FIG. 3, the execution result value table

10   30 under control of the execution result storage part 7 includes a job name 31 to store a name of a job to be executed, a execution result time 32 to store a period of time used to execute the job, an execution result 33 to indicate a status at termination of the job, an

15   execution start date and time item 34 to store a date and time item indicating a point of time at which the job execution is started, and an execution end date and time item 34 to store a date and time item indicating a point of time at which the job execution is finished.

20   FIG. 4 shows an example of data items in a monitoring item table of the embodiment. As shown in FIG. 4, the monitoring item table 40 under control of the monitoring item storage part 9 includes a monitoring item 41 indicating a name of a device as a

25   monitoring object of the point monitoring section 4, a specific monitoring item 42 indicating a specific resource as a monitoring object of the point monitoring section 4, a state 43 indicating a monitored state of

the resource, a place 44 indicating a country and an area of the same international date in which the resource is monitored, an rate of operation 45 of the resource, and a monitoring date and time item 46 indicating a period of time during which the resource operates at the rate of operation.

It is also possible to set a threshold value such that when a state associated with the threshold value occurs, an event is notified to the integrated monitoring section 2 according to the state of each resource. For example, in an operation to monitor a network device, when a traffic value of a network exceeds a threshold value specified in advance, the event issuance part 8 issues an event to the integrated monitoring section 2. Or, in an operation to monitor a storage, when a predetermined state takes place, for example, when a state represented by a combination of a storage type and data capacity thereof or a state indicating that a predetermined retry count is exceeded takes place, the event issuance part 8 issues an event to the integrated monitoring section 2.

The event issuance section 8 may use various notifying methods according to priority of each item. For example, the section 8 may send an event in a real-time operation or may send a batch of events in a batch processing manner. For example, when a job terminates abnormally in the job executing section 5 or when the state 43 being monitored in the point monitoring

section 4 is changed, a high priority value of "1" is
assumed and an event is transmitted in a real-time
fashion. When the job execution schedule is changed,
an intermediate priority of "2" is assumed. When the
5 monitoring object name is changed, a lower priority of
"3" is assumed. The manager can set the priority level
in this way to reduce the load imposed on the network
and the integrated monitoring section 2.

FIG. 5 shows an example of data items in a
10 browse screen display time adjusting table of the
embodiment. As shown in FIG. 5, the browse screen
display time adjusting table 50 stored in the data
storage section 10 includes a management group 51
indicating a name of a monitoring object used to
15 collectively management a work, a monitoring object 52
indicating a job as a monitoring object, an execution
monitoring start date and time item 53 indicating a
date and time to start monitoring the job, an execution
monitoring end date and time item 53 indicating a date
20 and time to finish monitoring the job, and a monitored
status 55 indicating a status of the job.

Next, description will be given of processing
in the job status monitoring system to monitor statuses
of jobs executed on a computer. In the processing, a
25 job scheduled for execution during a browsing time zone
to browse monitored statuses is selected and a
monitored status of the job is displayed.

The job storage part 6 of the job executing

section 5 stores an execution schedule of each job to be executed by the job executing section 5 in the schedule table 20 to control the execution schedule. When a schedule change request is received from the

5 manager, the job storage part 6 updates the schedule table 20 according to items specified in the request.

The execution result value storage part 7 stores, when the job executing section 5 initiates a job, execution result values such as the execution

10 result time 32 in the execution result value table 30 according to a status of execution of the job.

The event issuance part 8 of the job executing section 5 monitors update states of the schedule table 20 and the execution result value table

15 30. When a change occurs in the tables, the event issuance part 8 notifies an event of the table change to the integrated monitoring section 2.

The event receiving part 15 of the integrated monitoring section 2 receives the event sent from the

20 event issuance part 8 and then notifies the table change indicated by the event to the monitoring item acquiring part 11.

The part 11 receives the table change notification, creates a record including the job name

25 in the table change notification as a monitoring object 52, and adds the record to the browse screen display time adjusting table 50. In the operation, it is also possible to classify monitoring objects into groups.

Specifically, it is possible to set a management group 51 to collectively treat a plurality of monitoring objects according to a predetermined rule.

For example, such groups can be set for
5 respective servers using the host name specified in the related item 25 for each job. By assigning an index to any other item, the monitoring objects can be classified into groups. The operation to produce groups may be conducted at timing when the associated
10 item is collected or immediately after the operation is started. Or, the control groups may also be formed in a hierarchic configuration.

Thanks to provision of the groups, when the monitor screen is browsed in tree structure, the
15 collected display images are easy to understand although the images are displayed in many hierarchic levels. When the monitor screen is browsed in a map layout, the screen image can be displayed for each monitoring object. However, when the images are
20 collected according to each control group, the user can visually and easily understand the displayed items.

The monitoring item acquiring part 11 obtains the execution start schedule date and time 23 and the execution result time 32 from the received table change
25 notification. Using a total value of the execution result time 32 and the execution result time 32 notified by each event of the job in the past, the part 11 makes the execution result value calculating part 12

calculate a mean value of the execution result time 32
to resultantly obtain an execution time optimal value.

The monitoring item acquiring part 11 stores
the execution start schedule date and time 23 in the
5   execution monitoring start date and time 53. The part
11 adds the execution time optimal value to the
execution time optimal value to obtain a predicted end
date and time value and sets the obtained value to the
execution monitoring end date and time 54. In the
10   operation, it is also possible that the part 11
subtracts a predetermined period of time from the
execution start schedule date and time 23 to obtain a
value and stores the value in the execution monitoring
start date and time 53. The part 11 adds a
15   predetermined period of time to the predicted end date
and time to obtain a value and sets the value to the
execution monitoring end date and time 54.

As above, by setting the execution monitoring
start date and time 53 to a point of time before the
20   execution start schedule date and time 23, information
can be collected from the point monitoring section 4
before the execution of the job is started to confirm
presence or absence of an abnormal event in a resource
such as the central processing unit. By setting the
25   execution monitoring end date and time 54 to a point of
time after the predicted end date and time, the
monitoring can be continuously carried out even if the
execution of the job exceeds the predicted end date and

time.

On the other hand, the browsing date and time setting part 17 of the integrated monitor screen browsing section 3 receives specification items of the

5   browsing start date and time indicating a point of time to start browsing monitored statuses and the browsing end date and time indicating a point of time to finish browsing monitored statuses from the browsing operator. The part 17 then sends to the integrated monitoring

10 section 2 the browsing start date and time, the browsing end date and time, and a browsing place to browse monitored statuses, i.e., information indicating a country and an area in which the integrated monitor screen browsing section 3 is installed.

15   When the user inputs, for example, "May 15th, 9:00 to 17:00" for the browsing start date and time and the browsing end date and time, the monitor screen display part 18 displays only application jobs which are executed or which are being executed during a

20 period of time from 9:00 to 17:00 on May 15th. To browse the present or current statuses, the user specifies at least the present time as the browsing start date and time. When the specified date and time item indicates a point of time in the past, the display

25 part 18 displays monitored statuses of application jobs executed in the past. When the specified date and time item indicates a point of time in the future, the display part 18 displays application jobs to be

executed in future and information of failure influencing the application jobs. It is assumed in the embodiment that if the browsing start date and time and the browsing end date and time are not specified, the

5   display part 18 executes processing to browse a job status monitoring screen for all jobs.

When the information is received from the browsing date and time setting part 17, the integrated monitoring section 2 makes the browsing date and time

10   correcting part 14 execute processing to correct information of the date and time according to the time difference between the browsing place or location to browse monitored statuses and the execution place to execute the job.

15   FIG. 6 shows in a flowchart a processing procedure to correct the browsing date and time information in the embodiment. The flowchart shows a flow of processing for the browsing date and time correcting part 14 to correct the browsing date and

20   time. The browsing operator inputs a period of browsing time using the browsing date and time setting part 17.

In step 61, the browsing date and time correcting part 14 refers to the contents of the

25   information received from the integrated monitor screen browsing section 3 and makes a check to determine whether or not the browsing start date and time and the browsing end date and time have already been set. If

these items are absent, the part 14 registers all
monitoring objects as browsing objects in step 62. If
these items are present, control goes to step 63.

In step 63, the browsing date and time
correcting part 14 refers to the contents of the
information received from the integrated monitor screen
browsing section 3 to obtain the browsing place and
compares the browsing place with the contents of the
execution place 24 in the schedule table 20 to
determine whether or not the country of the browsing
place is substantially equal to that of the execution
place 24. If the countries are equal to each other,
control goes to step 64; otherwise, control goes to
step 65.

In step 64, the browsing date and time
correcting part 14 compares the browsing place from the
section 3 with the contents of the execution place 24
in the schedule table 20 to determine whether or not
the area of the same international date of the browsing
place is substantially equal to that of the execution
place 24. If the areas are equal to each other, the
part 14 terminates the processing; otherwise, control
goes to step 65.

In step 65, using the time difference between
the time of the country and area of the browsing place
and Greenwich Time and the time difference between the
time of the country and area of the execution place and
Greenwich Time, the browsing date and time correcting

part 14 calculates the time difference between the
browsing place and the execution place. The part 14
subtracts the time difference from the browsing start
date and time and the browsing end date and time to
obtain the corrected values of these items. The part
14 then stores these corrected values in the memory
with a correspondence established between these values
and the job name 21 of the execution place.

The browse screen display time adjusting part
13 of the integrated monitoring section 2 makes a check
to determine whether or not a browsing time zone
between the browsing start date and time and the
browsing end date and time overlaps with a monitoring
time zone between the execution monitoring start date
and time 53 and execution monitoring end date and time
54 to execute processing to select a job as a browsing
object.

FIG. 7 shows a processing procedure of the
processing to select a browsing object in the
embodiment in a flowchart. In step 71, the browse
screen display time adjusting part 13 refers to the
browse screen display time adjusting table 50 and
compares the execution monitoring start date and time
53 with the browsing end date and time received from
the integrated monitor screen browsing section 3. If
the value of the execution monitoring start date and
time 53 is less than or equal to that of the browsing
end date and time, control goes to step 72. Otherwise,

control goes to step 74. It is assumed that when the corrected browsing end date and time corresponding to the job name 21 associated with the monitoring object 52 is already stored in the memory, the corrected

5 browsing end date and time is used.

In step 72, the adjusting part 13 refers to the time adjusting table 50 to compare the execution monitoring end date and time 54 with the browsing start date and time received from the integrated monitor

10 screen browsing section 3. If the value of the execution monitoring end date and time 54 is more than or equal to that of the browsing start date and time, control goes to step 73. Otherwise, control goes to step 74. It is assumed that when the corrected

15 browsing start date and time corresponding to the job name 21 associated with the monitoring object 52 is present in the memory, the corrected browsing start date and time is used.

In step 73, the browse screen display time

20 adjusting part 13 selects the monitoring object as a browsing item and stores the job name of the monitoring object 52 in the memory. In step 74, the part 13 sets the monitoring object 52 as the non-browsing item and makes a check to determine whether or not the job name

25 of the monitoring object 52 is present in the memory. If the job name is present therein, the part 13 deletes the job name from the memory.

In step 75, the part 13 makes a check to

determine whether or not the date and time comparison
has already been conducted for all monitoring objects.
If the comparison has not been finished for all
monitoring objects, control returns to step 71 to

5   continue the processing. If the comparison has been
finished for all monitoring objects, the processing is
terminated.

When the browsing item is selected as above,
the integrated monitor screen data generating part 16

10   obtains from the memory a job name of the job selected
as the browsing item by the browse screen display time
adjusting part 13. The part 16 then obtains from the
data saving section 10 the monitored status 55 of the
monitoring object 52 corresponding to the job and other

15   information regarding the job to create monitor screen
data to display the status of the job. The part 16
then sends the data to the integrated monitor screen
browsing section 3.

In the section 3, the monitor screen display

20   part 18 receives the monitor screen data generated by
the integrated monitor screen data generating part 16
from the integrated monitoring section 2 and executes
processing to display a monitor screen on a display of
the integrated monitor screen browsing section 3 to

25   monitor job statuses.

After the integrated monitor screen data
generating part 16 creates the monitor screen data,
when the event receiving part 15 receives an event

having a high priority level such as a change of the
state 43 or a result of termination of a job, the data
generating part 16 creates monitor screen data
according to the contents of the event. The part 16
5   sends the data to the integrated monitor screen
browsing section 3. As a result, the monitor screen is
appropriately updated to its latest state in the
processing.

When a job once displayed as above is
10 normally terminated, the job is deleted from the screen
image. However, when the job is abnormally terminated,
the job is kept displayed as a browsing item in the
screen image even after the execution monitoring end
date and time.

15   In the processing, a mean value of the values
of the execution result time 32 resultant from
execution of the job is used as the execution result
time to set the execution start date and time 53 and
the execution end date and time 54. However, it is
20 also possible that using a relationship between the
execution result time 32 and the rate of operation at
the execution of the job, the system calculates the
execution time optimal value indicating the period of
time to execute the job at the rate of operation and
25 stores the optimal value in the data saving table of
the data saving section 10. The execution start date
and time 53 and the execution end date and time 54 are
set using the execution time optimal value as the

execution time.

FIG. 8 shows an example of data items in the
data saving table of the embodiment. As can be seen
from FIG. 8, the data saving table 80 includes a
5   control group 81 indicating a name to collectively
control the monitoring item, a monitoring object 82
indicating a job to be monitored, a date and time type
83 storing a schedule type to discriminate the work
types such as a weekly work to be executed once a week,
10   a daily work to be daily executed, and a work to be
executed on a particular day specified in advance, an
execution start schedule date and time field 84 to
store a date and time item to start execution of the
job, a related monitoring item 85 indicating resources
15   which are selected from the resources being monitored
by the point monitoring section 4 and which influence
execution of the job, an operation index 86 classifying
the rate of operation in several levels, and an
execution time optimal value 87 indicating a period of
20   execution time calculated in consideration of the rate
of operation.

FIG. 9 is a graph showing an example of
analysis results obtained by analyzing execution result
values of the embodiment. When a plurality of jobs are
25   executed and the rate of operation of a resource
becomes greater for a job, the operation index also
increases. It is considered in this situation that the
execution result time of the job becomes longer as

shown in FIG. 9. According to the method of least
squares, a straight line is used as an approximation of
the relationship between the operation index and the
execution result time to calculate the execution time
5   optimal value for each operation index.

The monitoring item acquiring part 11 makes a
search through the monitoring item table 40 using the
related item 25 of the schedule table 20 as a search
key to retrieve the monitoring item 41. In the table
10 20, the name of the host to execute the job is used as
a key to establish a correspondence between the related
item 25 and the monitoring item 41. However, any key
may be used only if the correspondence can be uniquely
established. After establishing the correspondence
15 between the related item 25 and the monitoring item 41,
the acquiring part 11 obtains the rate of operation 45
from the associated record and stores the ratio 45 as
the operation index 86 in the data saving table 80.
The value of the rate of operation 45 varies depending
20 on time zones in many cases. Therefore, at an interval
of predetermined period of time or when the operating
ratio 45 is varied, the acquiring part 11 obtains the
rate of operation 45 and stores the rate 45 in the data
saving table 80. When the point monitoring section 4
25 is absent, namely, when the point monitoring is not
conducted for the monitoring item 41 corresponding to
the related item 25 and hence the monitored status is
not known, the operation index is set to "0" in the

data saving table 80.

After the monitoring item acquiring part 11
completely establishes the correspondence between all
related items 25 and the monitoring item 41, the
5   execution result value calculating part 12 calculates
the execution time optimal value 87 using the operation
index 86.

FIG. 10 shows in a flowchart a procedure of
processing to calculate an execution time optimal value
10 in the embodiment. In step 101, the calculating part
12 makes a check to determine whether or not any
variation is present in the execution result time 32.
The calculating part 12 calculates the difference
between the minimum execution result time and the
15 maximum execution result time and determines whether or
not the time difference is within 0.01% of the overall
execution result time. If the execution result time
difference is within this range, the calculating part
12 assumes that no variation is present in the
20 execution result time 32 and goes to step 102. The
calculating part 12 selects one value from the most
frequently appearing values of the execution result
time and sets the value to the execution time optimal
value 87. In this situation, the operation index 86 is
25 set to "0" and is not taken into consideration.

When no variation is present in the execution
result time 32, the calculating part 12 goes to step
103 to refer to the rate of operation. When the point

monitoring is not conducted, the rate of operation 45 has not any data. Therefore, the calculating part 12 goes to step 104 to set "0" to the operation index 86 and goes to step 107. The calculating part 12 adds the

5   values of execution result time 32 to each other to obtain a total value and divides the total value by the number of the measured values to obtain a mean value. The calculating part 12 then sets the mean value to the execution time optimal value 87.

10   If the variation is not found in the rate of operation 45 in step 105 even when the point monitoring is conducted, the calculating part 12 goes to step 106 to obtain the operation index 86 according to the levels of the rate of operation. In step 107, the

15 calculating part 12 adds the values of execution result time 32 to each other to obtain a total value and divides the total value by the number of measured values to obtain a mean value. The calculating part 12 sets the mean value to the execution time optimal value

20 87.

          When the variation is found in the rate of operation 45 in step 105, it is assumed that load varies between resources in the execution of the job. Therefore, the calculating part 12 goes to step 108.

25 Assuming that the execution result time is y and the operation index is x, the calculating part 12 obtains the execution time optimal value using the method of least squares in which the residual sum of squares of

the execution result time and the operation index takes a minimum value.

Assume that the execution result time y is represented by expression 1 and the number of the measured values of the execution result time is n. The execution time optimal value is determined by obtaining values of a and b satisfying expression 2.

$$y = a + bx \qquad \qquad ..... (1)$$

$$\sum_{i=1}^{n} \{y_i - (a + bx_i)\}^2 = 0 \qquad ..... (2)$$

After the values of a and b are obtained, the execution result value calculating part 12 calculates the execution time optimal value 87 corresponding to the operation index 86 at one of the levels (seven levels in FIG. 9) using expression 1.

When the calculating part 12 calculates the execution time optimal value 87, the monitoring item acquiring part 11 determines the execution monitoring start date and time 53 and the execution monitoring end date and time 54 using, for example, expression 3.

Execution monitoring start date and time = Execution start schedule date and time - Operation index × c - Abnormal termination count × d

Execution monitoring end date and time = Execution start schedule date and time + Execution time optimal

value + Operation index × f + Abnormal termination

count × g   .... (3)

In expression 3, time coefficients c, d, f, and g are arbitrary periods of time.

In the embodiment, thanks to provision of indices influencing applications or jobs such as a

5   value of the operation index indicating an rate of operation of a resource and the abnormal termination count indicating the number of abnormal terminations, the monitoring time can be elongated to filter the browsing item by the browsing date and time according

10 to the application schedule in consideration of the execution result time. The manager can set the time coefficients at a desired point of time. Therefore, when it is desired to filter the browsing item only by the execution schedule time without any marginal width,

15 the manager sets "0" to all time coefficients.

To monitor any abnormal termination of a job, the manager sets, for example, an execution monitoring end date and time item to provide width after the termination of the job execution. To monitor

20 occurrence of failure before the execution start schedule start date and time of a job, the manager sets, for example, the execution monitoring start date and time to an earlier point of time.

FIG. 11 shows a tree-structure display

25 example on a job status monitoring screen in the

embodiment by the current technique or not using this invention. In FIG. 11, when the browsing date and time setting part 17 of the embodiment does not set the browsing start date and time and the browsing end date

5 and time, the job status monitoring screen is displayed in tree structure according to a request from the user. Monitoring items are displayed in hierarchic structure for work groups such as work group 1, work 2, ... for each operation site or location. In the example, a

10 fault has occurred in the work 2 and the pertinent monitoring item is blinking or is indicated in, for example, red.

In FIGS. 11 to 14, a fault occurs at a point indicated by a star and the pertinent monitoring item

15 is blinking or indicated in red. However, the item is not necessarily blinking. Any indication, for example, a symbol or a color may be used only if such an indication is easily recognized by the user.

FIG. 12 shows a tree-structure display

20 example on the job status monitoring screen in the embodiment by using this invention. In the example of FIG. 12, when the browsing date and time setting part 17 of the embodiment sets the browsing start date and time and the browsing end date and time, the monitor

25 screen display part 18 displays the job status monitoring screen in tree structure in association with the work schedule according to a request from the user. Only the works 2 and 5 scheduled to be executed in a

browsing time zone set by the browsing date and time setting part 17 are displayed. Only the work 2 in which a fault has occurred is blinking or is indicated in red.

5   FIG. 13 shows an example of a display image displayed in a map layout on a job status monitoring screen by the current technique or not using this invention. In FIG. 13, when the browsing date and time setting part 17 of the embodiment does not set the

10   browsing start date and time and the browsing end date and time, the monitor screen display part 18 displays the job status monitoring screen in a map layout. Monitoring items are displayed in a map layout for work groups such as work group 1, work 2, ... for each

15   operation site. In the example, a fault has occurred in the application 2 and the pertinent monitoring item is blinking or is indicated in, for example, red.

          FIG. 14 shows a display example displaying items in a map layout on the job status monitoring

20   screen of the embodiment by using this invention. In the example of FIG. 14, when the browsing date and time setting part 17 sets the browsing start date and time and the browsing end date and time, the monitor screen display part 18 displays the job status monitoring

25   screen in a map layout according to the work schedule. Only the works 2 and 5 scheduled to be executed in a browsing time zone set by the browsing date and time setting part 17 are displayed. Only the work 2 in

which a fault has occurred is blinking or is indicated in red.

In the embodiment, only the information items of works requested by the operator to browse the job status monitoring screen are displayed. Therefore, the job statuses can be efficiently monitored regardless of the browsing place to browse the statuses, experiences of the browsing person, and the numbers respectively of applications and faults.

According to the embodiment of the job status monitoring system described above, the system selects jobs scheduled to be executed in a time zone to browse job statuses and displays the statuses of the jobs. Therefore, the statuses of the jobs executed on a computer can be efficiently monitored at a high speed. The system can also efficiently deal with faults in the jobs at a high speed.

According to the present invention, jobs scheduled to be executed in a time zone to browse job statuses are selected and the statuses of the jobs are displayed. Consequently, it is possible to efficiently monitor at a high speed the statuses of jobs executed on a computer. It is also possible to efficiently deal with faults in the jobs at a high speed.

It should be further understood by those skilled in the art that although the foregoing description has been made on embodiments of the invention, the invention is not limited thereto and

various changes and modifications may be made without
departing from the spirit of the invention and the
scope of the appended claims.